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A Diagnostic Review of Three Bovine Neurological Diseases

John Cunningham*

The seasonal occurrence of three of the more commonly seen central nervous system diseases is again coming to the forefront. This review will center around the etiology and clinical differentiation of thrombo-embolic meningoencephalitis (TEM), polioencephalomalacia, and listeriosis. There are many conditions which may give similar clinical symptoms; however with a thorough central nervous system examination, each disease has certain peculiarities which may help the practitioner reach a clinical diagnosis.

It is of prime importance to be able to recognize the normal and abnormal reactions which may result from damage to one or more of the twelve cranial nerves. The casual observer will note that each disease may exhibit ataxia, weakness, excitement, prostration, opisthotonos, coma, and convulsions; therefore, a critical evaluation of the cranial nerve functions is necessary. A short review of each disease follows with specific neurological techniques described to more easily differentiate these feedlot diseases.

Thrombo-embolic Meningoencephalitis

Thrombo-embolic meningoencephalitis

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(TEM) is an acute and febrile disease of cattle which is characterized by incoordination and coma from localized infective emboli throughout the brain. The etiologic agent has not been definitely established but investigation has found that a *Hemophilus*-like² organism produces lesions similar to those found under field conditions. Seasonally this disease occurs more commonly during the fall and winter months and in animals of both sexes between one and two years of age. An understanding of the pathogenesis of TEM is important in order to recognize and understand the clinical signs and to make an accurate differential diagnosis. The random distribution of the lesions is highly suggestive that the causative agent is carried by the blood, setting up multiple infective emboli in the brain. The infective emboli occlude small cerebral blood vessels which leads to diffuse cerebral hemorrhage and infarctions. The hemorrhageonecrotic tissue of the brain results in the diffuse red areas which are grossly visible upon post mortem examination. Hence the clinical signs and resulting fatalities result from the location of the lesion in a vital or nonvital area in the brain.

Visual impairment can be easily determined by eliciting a blink as the hand is brought toward the eyes. In TEM, pupillary

Diagnostic clinical laboratory data

	Temp (F)	CSF Pressure	CSF Cell no.	CSF Cell Type	Pandytest
Listeriosis	105-106	300-550	100-200	lymphocytes	±
TEM	105-106	300-550	>200	neutrophils	+
Polio-	Normal	300-600	<100	lymphocytes	±

closure may cause apparent blindness. The administration of ophthalmic atropine ointment will dilate the pupil and restore sight.

Examination of the 3rd, 4th, and 5th cranial nerves and the normal versus the abnormal positions of the eye may be helpful in making a diagnosis. Paralysis of the third nerve forces the eye into a ventro-medial position. Fourth cranial nerve paralysis causes the pupil to be deflected dorsally and the eye is rotated dorsolaterally. It is a common occurrence in TEM cases for third nerve paralysis in one eye and fourth nerve paralysis in the opposite eye.

Evaluation of the seventh cranial nerve is useful in determining mild cases of listeriosis or TEM. The facial nerve is motor to the facial muscles and has secretory activity to the salivary glands. Its function can be evaluated by placing a quinine sulfate solution on the dorsum of the tongue and observing the presence or absence of salivation. Normally, salivation ceases; however in listeriosis and mild cases of TEM, drooling of saliva continues.

The ninth and tenth cranial nerves supply the pharyngeal muscles and affect swallowing. A swallowing reflex can be elicited by pulling out the tongue and releasing it. The absence of this sign is often an indication of TEM. Spinal reflexes will appear normal.

Polioencephalomalacia

Polioencephalomalacia is a non-infectious disease of feedlot and pasture cattle. It is characterized by softening, restricted to the cerebrocortical grey matter and to necrosis of laminar distribution.

The occurrence of polioencephalomalacia is most prevalent in feedlot and pasture cattle of both sexes whose ages range from three months to four years. Its sea-

sonal occurrence is more common during the winter months; however this may be related to larger numbers of cattle in the fattening lots during this time of the year.

The specific etiology of polioencephalomalacia is not known. Due to the clinical signs and post mortem lesions, it has been postulated that a hypoxia and an intoxication may be involved. Bacterial cultures from affected brains has yielded no consistent or significant microorganisms. Experimental parenteral inoculation of brain tissue from affected animals to normal animals were unsuccessful. Chemical analysis of the brain and other tissues were negative for selenium, lead, arsenic, hypoglycemia, methemoglobin and *Clostridium perfringens* Type D toxin. The etiologic agent is responsible for widespread cerebral cortical degeneration, leading to neurological signs seen in the field, i.e., blindness, incoordination, and coma.

The forebrain is responsible for olfactory function and may be evaluated by forcing the patient to inhale cigarette smoke. Normally, the animal will shake its head to avoid the smoke. Polioencephalomalacia cases may show no response due to high cerebrospinal fluid pressure. Bilateral blindness is also associated with polioencephalomalacia. Bilateral fourth cranial nerve paralysis is another common finding. Spinal cord reflexes may be reversed in the spastic forelegs, which is relative to the area and extent of cerebral cortex involvement.

Listeriosis

Listeriosis is an acute infectious central nervous system disease, with associated abortions occurring in pregnant cattle. The disease is caused by a bacterium, *Listeria monocytogenes*; the organism being found in the brain stem or uterus of affected cattle. The organism gains entrance either orally or intranasally, enters the blood

stream via the lymphatics, is carried to the brain stem where the infection localizes, and accounts for the clinical signs.

Ophthalmic examination may likely reveal a corneal opacity and an associated unilateral blindness. The partial seventh nerve paralysis reduces lacrimal secretion and the cornea becomes dry. Listeriosis victims are neurologically very similar to TEM patients, especially with unilateral or asymmetrical bilateral cranial nerve involvement. Listeriosis animals differ in that they are much more ambulatory and

not as helpless as animals affected by TEM. Listeriosis victims separate themselves from the herd and wander aimlessly or in circles. Drooling saliva is a constant sign with secondary corneal opacity following loss of seventh nerve function.

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Book Review

By

Keith W. Prasse, D.V.M.*

A TEXTBOOK OF VETERINARY CLINICAL PATHOLOGY, edited by W. Medway, J. E. Prier, and J. S. Wilkinson. Published by Williams and Wilkins, Baltimore, Maryland. 1969. Price \$14.50

The use of laboratory methods in solution of clinical problems in veterinary medicine has increased remarkably in recent years. As stated in the Foreword of this new text, the most severe limitation to full utilization of laboratory data is at the stage of interpretation. For this reason *A Textbook of Veterinary Clinical Pathology* will be a useful addition to the bookshelf of practitioners and students.

Discussion is directed to the relationship between anatomical, physiological, and biochemical changes in disease and the changes to be expected in laboratory-measured parameters. Chapters which are notable for in-depth coverage include: Liver Function Tests, The Pancreas and its Diseases, Kidney Disease and Urinalysis, Urinary Calculi, Hydrogen Ion Concentration-Anion-Cation (Acid-Base) Balance and Endocrine Function. Chapters related to hematology adequately cover basic subjects. The chapter entitled, "Blood Coagulation and Hemorrhagic Disorders" has been written in great depth compared to the usual treatment of this subject in veterinary literature. Chapters on laboratory methods in diagnosis of bacterial, viral, mycotic, and parasitic diseases are included in the text. The book also includes chapters on evaluation of transudates and exudates, diagnostic cytology, semen evaluation, and pregnancy diagnosis.

In summary, this textbook will provide the student and practitioner with good interpretive information on laboratory results. It will not suffice as a source for laboratory methodology by itself, although some methods are outlined in detail. The book has excellent reference lists.

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